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SPRINGFIELD SECONDARY SCHOOL

End-Of-Year Examination 2019

STUDENT
NAME

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CLASS

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INDEX
NUMBER

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BIOLOGY

Secondary 3 Express
Paper 1 Multiple Choice

6093/01
10 October 2019
1 hour

Additional materials:
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staplers, paper clips, glue or correction fluid.

Write your name, class and index number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this paper.

The use of an approved scientific calculator is expected, where appropriate.

For Examiner's Use	
Total	/40

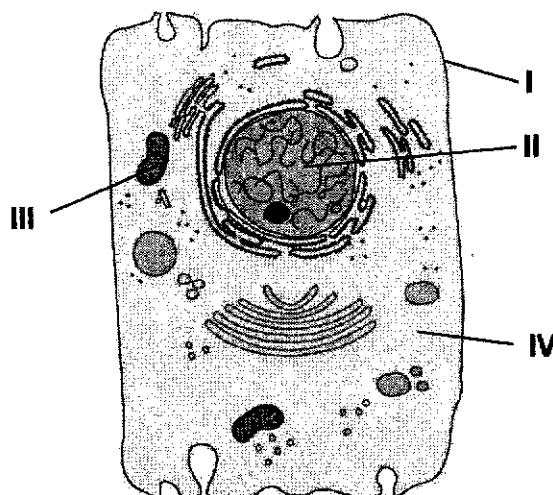
Do not turn over this question paper until you are told to do so.

This question paper consists of 18 printed pages.

[Turn over

2

- 1 The diagram below shows a drawing of a typical cell.



Which of the following organelles is matched correctly to its function?

	structure	function
A	I	chemically modifies and transports substances out of the cell
B	II	contains pigments that carry out photosynthesis
C	III	site of aerobic respiration and releases energy for cell
D	IV	maintains the shape of the cell

- 2 An animal cell had its nucleus removed. The cell was then put in a solution that promotes cell division. For one day, it continued to survive, but it did not undergo cell division.

Another cell used as a control (with no organelles removed) divided twice in that time.

What can be concluded from this experiment about the role of the nucleus in the cell?

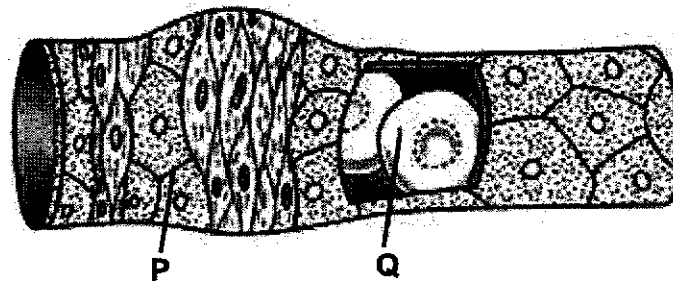
- A** The nucleus is essential for life.
- B** The nucleus is essential for cell division.
- C** The nucleus controls most activities of the cell.
- D** The nucleus is the only part of the cell that contains DNA.

3

3 Which of the following is normally found in plant cells but **not** animal cells?

- A centrioles
- B tonoplast
- C vacuoles
- D vesicles

4 A section of a blood capillary has been cut as shown in the diagram below.



What is the level of organisation of the structures labelled P and Q?

	P	Q
A	organ	tissue
B	organ	cell
C	tissue	tissue
D	tissue	cell

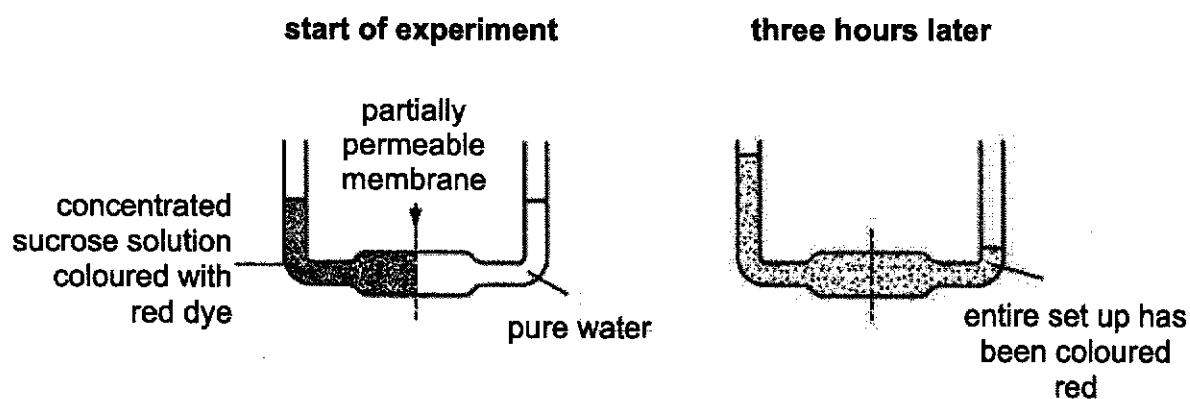
5 Which statement does **not** describe an adaptation of the red blood cell to its function?

- A The red blood cell lacks a nucleus to store more haemoglobin.
- B The red blood cell contains haemoglobin, which binds to oxygen and transports it around the body.
- C The red blood cell carries more mitochondria in order for the cell to move faster around the body.
- D The red blood cell has a circular biconcave shape, increasing surface area to volume ratio for quicker uptake of oxygen.

[Turn Over

- 6 Which of the following are possible examples of active transport?
- I movement of glucose molecules into the villi
 - II movement of water along a transpiration stream
 - III movement of protein molecules down a concentration gradient
 - IV movement of amino acids into the capillaries surrounding the nephron
- A I and II only
- B I and IV only
- C II and III only
- D III and IV only

- 7 The diagrams below show an experiment at the start, as well as the same experiment three hours later.



Which option **correctly** explains the movement of water as well as the red dye?

	movement of water	movement of red dye
A	diffusion	osmosis
B	diffusion	diffusion
C	osmosis	osmosis
D	osmosis	diffusion

5

- 8 The diameters of three onion rings were measured before and after they were immersed in equal volumes of sucrose solutions at different concentrations for 30 minutes. The results were recorded in the table below.

onion ring	initial diameter / cm	final diameter / cm
1	7.2	5.3
2	5.9	4.5
3	6.3	6.1

Which option **correctly** ranks the sucrose solutions that the onion rings were immersed in from the highest to the lowest water potential?

- A 1 → 2 → 3
- B 1 → 3 → 2
- C 3 → 2 → 1
- D 3 → 1 → 2
- 9 A food sample showed a brick red precipitate in Benedict's test, a violet solution in Biuret's test and a clear solution in an ethanol emulsion test.
- What does this food sample contain?
- A fats only
- B reducing sugar and fats only
- C reducing sugar and protein only
- D fats, reducing sugar and protein
- 10 Which property of water is important for chemical reactions to take place inside cells?
- A It acts as a solvent.
- B It is clear and transparent.
- C It has a high specific heat capacity.
- D It allows other substances to be adhered to its molecules.

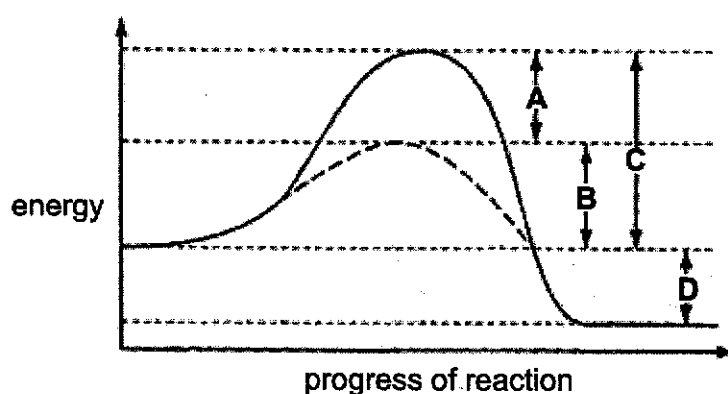
[Turn Over

11 Which elements are present in all carbohydrates?

- A carbon, hydrogen and oxygen
- B carbon, nitrogen and oxygen
- C carbon, hydrogen and nitrogen
- D hydrogen, nitrogen and oxygen

12 The graph below shows the changes of the energy levels during a reaction, both with and without an enzyme present.

Which option (A, B, C or D) correctly identifies the activation energy of the reaction without the presence of an enzyme?



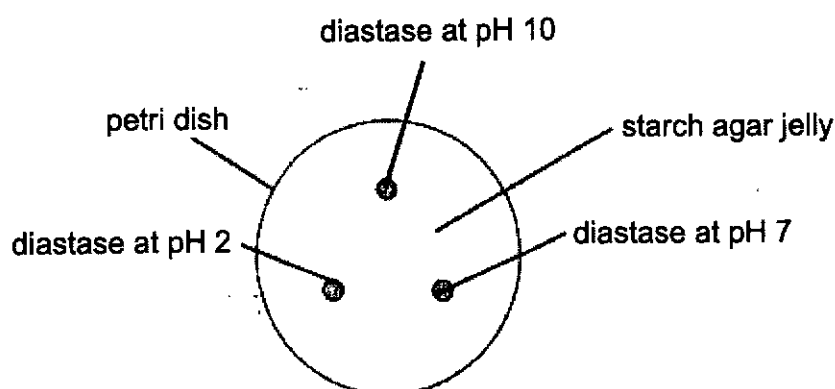
13 Catalase is used to break down hydrogen peroxide to hydrogen and oxygen.

Which option **correctly** shows the 'lock' and the 'key' according to the lock-and-key hypothesis?

	lock	key
A	hydrogen peroxide	catalase
B	catalase	hydrogen peroxide
C	catalase	hydrogen and oxygen
D	hydrogen and oxygen	catalase

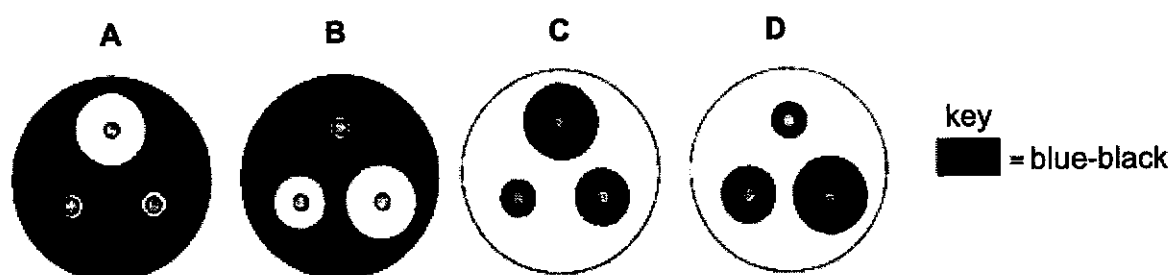
7

- 14 The diagram shows a petri dish of starch agar set up to investigate the effect of pH on the activity of diastase. Diastase converts starch into maltose in plants.

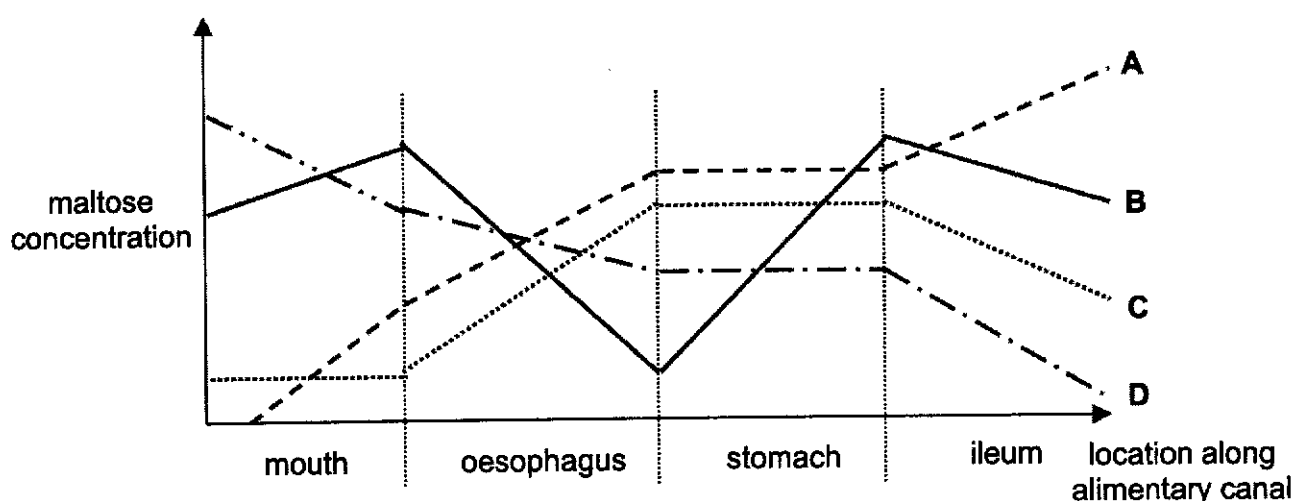


After 10 minutes at room temperature, the petri dish was flooded with iodine solution.

Which of the following diagrams (A, B, C or D) indicates that diastase is most active at pH 10?



- 15 Which graph (A, B, C or D) accurately shows the concentration of maltose along the alimentary canal?



[Turn Over]

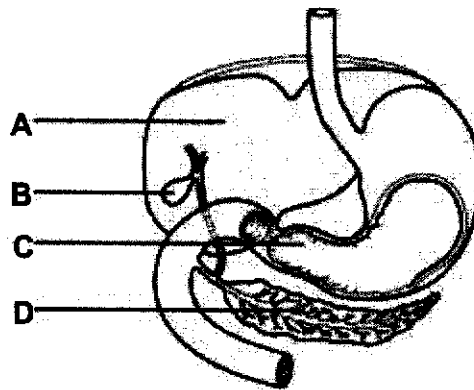
- 16 The statements below describe how the liver deals with excess glucose in the body.

- I converted to amino acids
- II converted to fats
- III deanimated to produce urea
- IV stored as glycogen

Which statements are **correct**?

- A I and II only
 - B I, II and III only
 - C II and IV only
 - D IV only
- 17 The diagram below shows part of the alimentary canal.

Which part of the alimentary canal (**A, B, C or D**) stores bile salts?



- 18 A patient was diagnosed with a disease that results in the thinning of the innermost layer of the stomach.

Which statement describes a potential consequence of this condition?

- A Churning of the stomach might not occur.
- B Gastric juice might be produced at even larger quantities.
- C The stomach will release its contents into the ileum more quickly.
- D The walls of the stomach might be destroyed by the acids over time.

- 19 Which of the following reactions occur in the small intestine during digestion?

	reactant	product	enzyme
I	proteins	polypeptides	pepsin
II	polypeptides	amino acids	peptidases
III	fats	fatty acids + glycerol	lipase
IV	starch	maltose	salivary amylase

- A I and II only
 B I, II and III only
 C II and III only
 D II, III and IV only

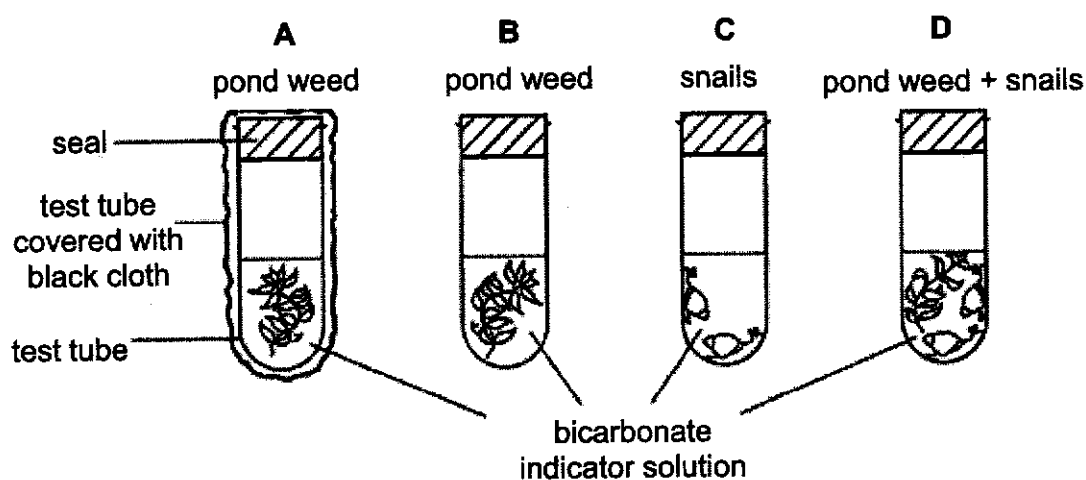
- 20 Four test tubes, **A**, **B**, **C** and **D**, are left in the sunlight for an hour. The contents of each test tube vary, but are all submerged in bicarbonate indicator.

The bicarbonate indicator will change colour according to pH levels:

- remains red if there is no change in pH levels.
- turns yellow if pH level decreases.
- turns purple if pH level increases.

The solution in all test tubes are red at the start of the experiment.

Which tube does the indicator turn yellow first?

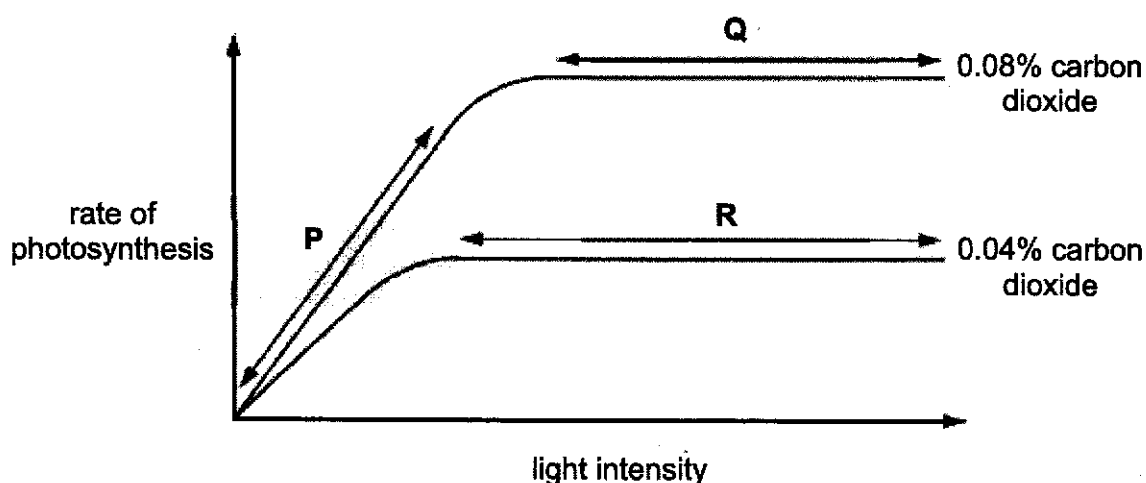


[Turn Over

21 What is a **correct** description about the light-dependent stage of photosynthesis?

- A Reduction of carbon dioxide occurs.
- B Enzymes are not involved in this stage.
- C Carbon dioxide and water are produced.
- D Light energy is converted into chemical energy by chlorophyll.

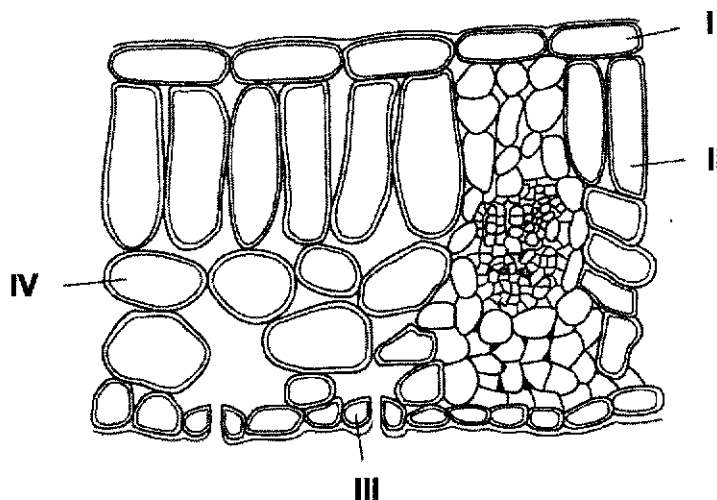
22 The graph shows the rate of photosynthesis of a plant at increasing light intensities at two different concentrations of carbon dioxide. The temperature is kept constant.



Which factor controls the rate of photosynthesis at each of the sections labelled P, Q and R?

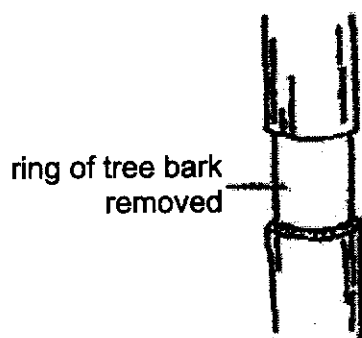
	P	Q	R
A	carbon dioxide	light intensity	light intensity
B	carbon dioxide	carbon dioxide	light intensity
C	light intensity	light intensity	carbon dioxide
D	light intensity	carbon dioxide	carbon dioxide

- 23 The diagram below shows the transverse section of a green leaf.



Which cells are able to carry out photosynthesis?

- A I and II only
 - B I and III only
 - C II, III and IV only
 - D I, II, III and IV
- 24 The diagram below shows a tree trunk with a ring of tree bark removed.

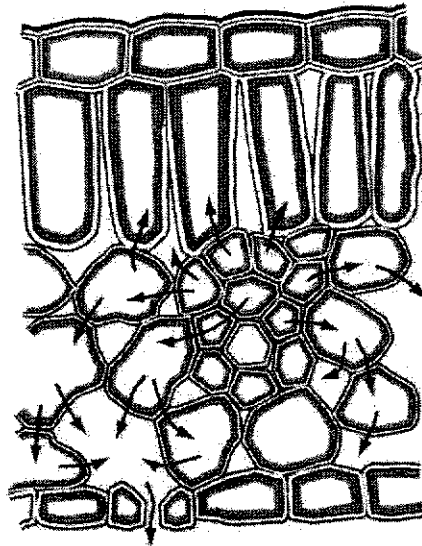


Which option explains why the tree will eventually die?

- A The supply of water to the leaves are cut off.
- B The supply of glucose to the root cells are cut off.
- C The supply of mineral salts to the leaves are cut off.
- D The supply of carbon dioxide to the root cells are cut off.

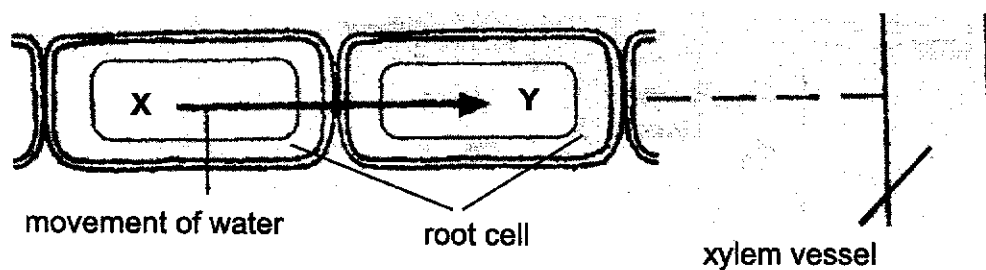
[Turn Over

- 25 The diagram below shows a section through a green leaf.



What do the arrows in the diagram represent?

- A carbon dioxide during respiration
 - B carbon dioxide during photosynthesis
 - C oxygen during respiration
 - D water during transpiration
- 26 The diagram below shows the flow of water from cell X to cell Y.

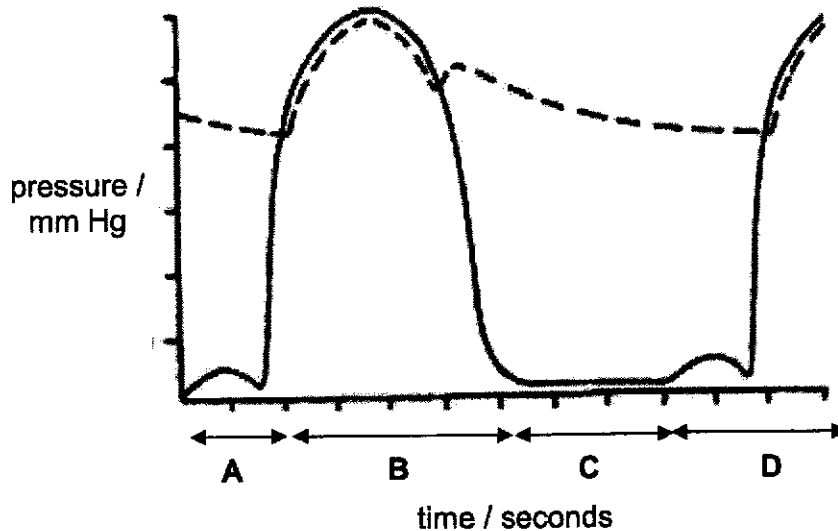


Which statement **correctly** explains the flow of water from cell X to cell Y?

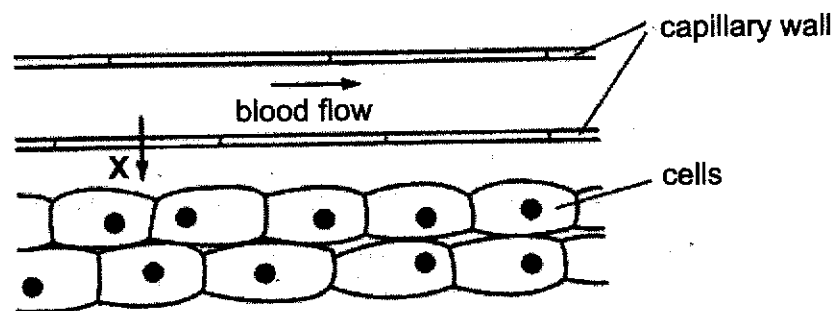
- A Diffusion is used by cell Y to absorb water from cell X.
- B Active transport is used by cell Y to absorb water from cell X.
- C The cell sap in cell X is less concentrated than the cell sap in cell Y.
- D The water potential of cell X is lower than the water potential of cell Y.

- 27 The diagram below shows the changes in pressure in the aorta and left ventricle of a person's heart.

Which period (A, B, C or D) are the semi lunar valves open?



- 28 The diagram below shows some tissue cells next to a capillary.



What is present in X?

- A amino acids and oxygen
- B fatty acids and water
- C glucose and blood platelets
- D insulin and haemoglobin

[Turn Over

- 29 Which statement **best** explains how thrombosis may lead to a heart attack?
- A High platelet levels lead to an increase in blood clotting, blocking the coronary arteries.
 - B High concentrations of fat-insoluble vitamins in diets lead to clogged vessels, blocking the vena cava.
 - C Fatty substances deposit on the inner surface of coronary arteries, leading to a formation of a blood clot and blocking the coronary arteries.
 - D Dilation of arteries cause the formation of blood clots, blocking off the flow of blood and oxygen to the heart muscles and leading to muscular death.

- 30 A blood sample was taken from an individual and tested with antibody A and antibody B respectively. The results are shown in the table below.

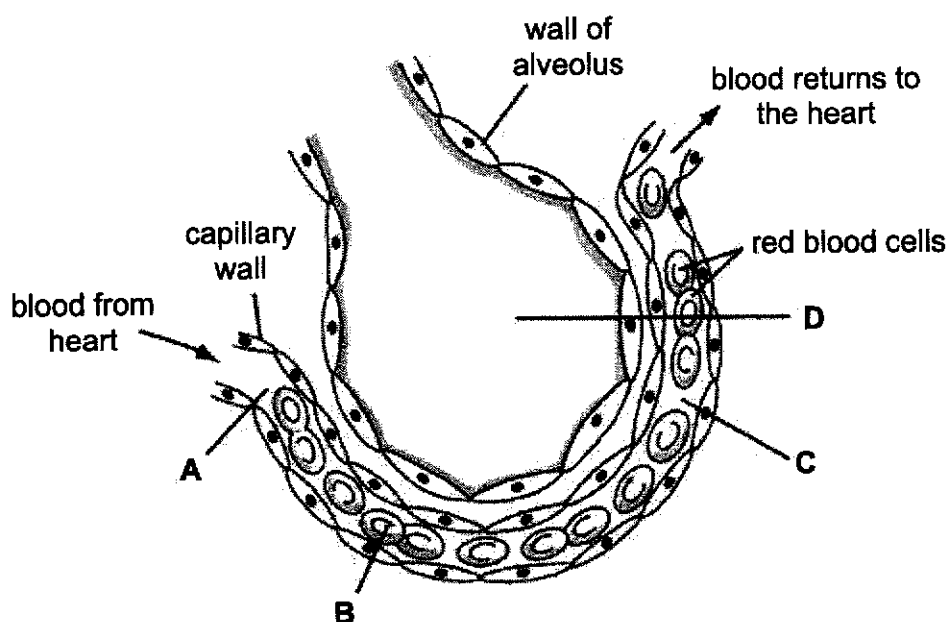
	antibody A	antibody B
Results of blood sample	 No clumping	 Clumping occurs

Which of the following blood groups can this individual donate his blood to?

- A blood group A
 - B blood group A and B
 - C blood group B and O
 - D blood group B and AB
- 31 How many times does an oxygen molecule pass through the heart when it travels from the lungs to the skeletal muscles in the leg?
- A once
 - B twice
 - C thrice
 - D does not pass through the heart

Refer to the diagram below for questions 32 and 33.

The diagram below shows a section through an alveolus and an associated blood capillary.



- 32 In which part (A, B, C or D) is the concentration of carbon dioxide the highest?
- 33 In which part (A, B, C or D) is the enzyme carbonic anhydrase found?
- 34 What happens to the volume of the lungs and the air pressure within the lungs during exhalation?

	lung volume	air pressure
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

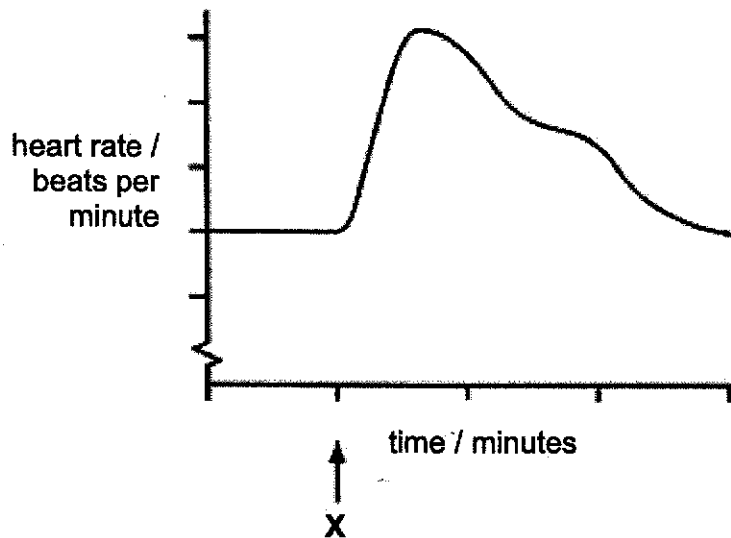
[Turn Over

- 35 A person is doing an intensive workout and is breathing heavily.

Which row gives the **correct** state of the respiratory muscles during inhalation?

	diaphragm muscles	internal intercostal muscles	external intercostal muscles
A	contracted	contracted	relaxed
B	contracted	relaxed	contracted
C	relaxed	contracted	relaxed
D	relaxed	relaxed	contracted

- 36 A person begins to smoke a cigarette at time X. The graph shows how the heart rate changes.



Which substance in cigarette smoke is the main cause of the change in heart rate at X?

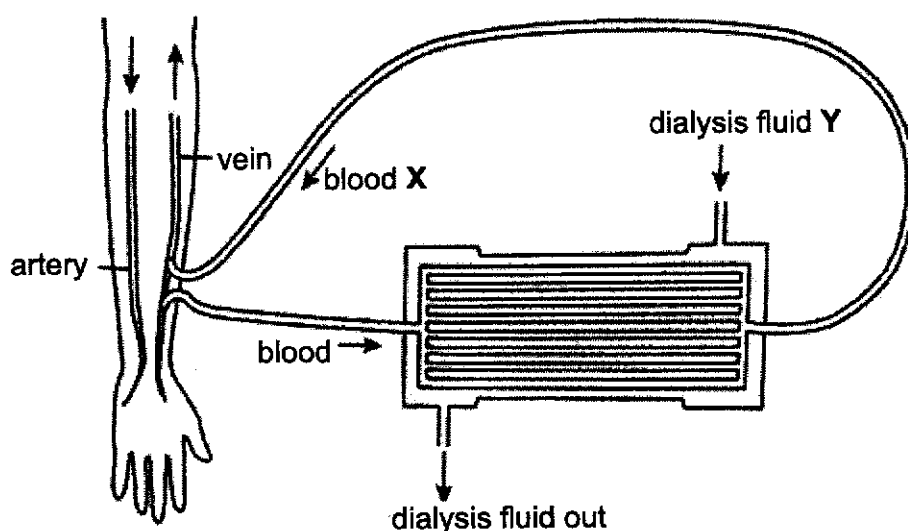
- A carbon monoxide
- B dust and smoke particles
- C nicotine
- D tar

- 37 Which statement about carbon dioxide removal from the lungs is **not** correct?
- A Carbon dioxide reacts with water in the red blood cells to form carbonic acid.
 - B In the lungs, hydrogencarbonate ions are converted back into carbonic acid.
 - C Carbonic anhydrase is an important enzyme in the carbon dioxide removal process.
 - D Most carbon dioxide is carried as hydrogencarbonate ions in red blood cells.

- 38 Which statement about excretory materials is **correct**?

- A All nitrogenous compounds must be excreted.
- B They always contain the element nitrogen.
- C They are always present in excess in the diet.
- D They are produced by the cells in the body.

- 39 The diagram shows the flow of blood and dialysis fluid through a kidney machine.

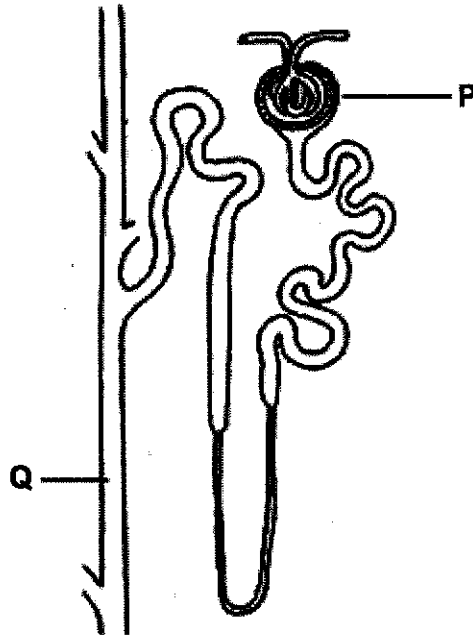


Which statement about X and Y is true?

- A X and Y do not contain much urea.
- B X contains glucose but Y does not contain glucose.
- C X and Y have the same concentration of glucose.
- D X contains a higher amount of amino acids compared to Y.

[Turn Over

- 40 The diagram below shows the simplified structure of a kidney nephron.



The table shows the quantities of three substances **1**, **2** and **3** as they pass through parts **P** and **Q** of the nephron.

substance	quantity passing through P / g	quantity passing through Q / g
1	160	1.2
2	50	48
3	220	0

What are the likely identities of substances **1**, **2** and **3**?

	substance 1	substance 2	substance 3
A	water	urea	glucose
B	amino acids	water	glucose
C	glucose	urea	amino acids
D	water	amino acids	urea



SPRINGFIELD SECONDARY SCHOOL **End-Of-Year Examination 2019**

STUDENT
NAME

CLASS

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BIOLOGY

Secondary 3 Express
Paper 2

6093/02

4 October 2019
1 hour 45 minutes

Candidates answer on the Question Paper
 No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
 Write in dark blue or black pen. You may use an HB pencil for an diagrams or graphs.
 Do not use staples, paper clips, glue or correction fluid.

Section A

Answer **all** questions in the spaced provided.
 Write your answers in the spaces provided on the Question Paper.

Section B

Answer **all** the questions. The last question is in the form either/or.
 Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.

You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B. At the end of the examination fasten all your work securely together.
 The number of marks is given in brackets [] at the end of each question or part question.

For Examiner's Use	
Section A	/50
Section B	/30
Total	/80

Do not turn over this question paper until you are told to do so.

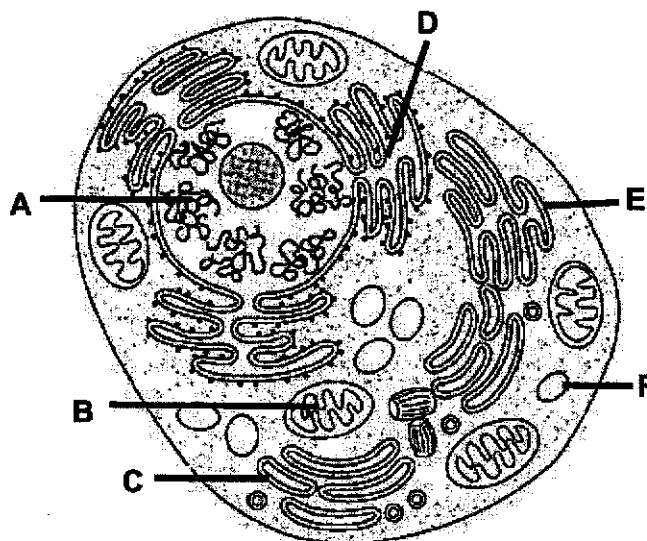
This question paper consists of 18 printed pages.

[Turn over

Section A

Answer all questions. Write your answers in the spaces provided.

- 1** The figure below shows a diagram of an animal cell containing organelles in which various substances are manufactured, processed or stored within a cell.



- (a)** Name the organelles labelled **A** to **F**. [3]

A:

D:

B:

E:

C:

F:

- (b)** Most enzymes are made by the organelles within cells. One example is pancreatic lipase, which is made by cells found within the pancreas.

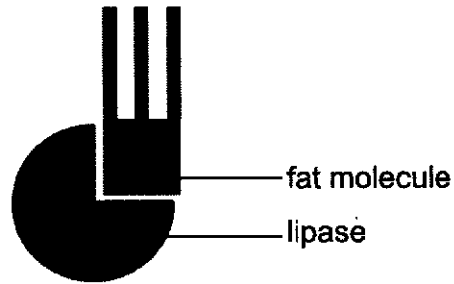
- (i) Using the information in the figure above, describe how pancreatic lipase made within the cell can reach the cell membrane to be released outside of the cell.

.....[3]

..[3]

3

- (ii) The diagram below shows the action of pancreatic lipase on a fat molecule.



With reference to the diagram above, describe clearly the mode of action of pancreatic lipase on fats.

.....

.....

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.....

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.....

.....[3]

- (iii) Suggest **two** functions of fats in the human body.

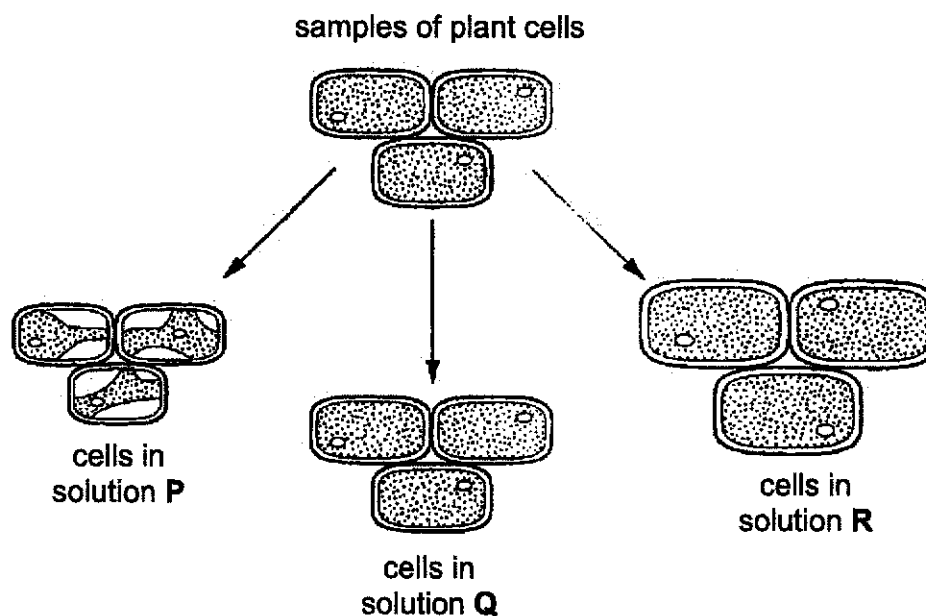
.....

.....[1]

[Total: 10]

[Turn over

- 2 The figure below shows the appearance of plant cells after a few minutes of placing into different solutions.



- (a) Name the process that caused the changes in appearance of plant cells in solution P and solution R.

.....[1]

- (b) Describe and explain the changes that took place in solution P.

.....

.....

.....

.....

.....

.....[3]

- (c) Explain why the plant cells did not change in appearance when placed in solution Q.

.....

.....

.....[2]

[Total: 6]

5

- 3 (a) Define the term 'enzyme'.

.....
[1]

- (b) An enzyme found in the human body was boiled at 100 °C for 10 minutes.
 Explain why the enzyme can no longer catalyse any reaction.

.....

[3]

[Total: 4]

- 4 The table below shows the percentage of carbohydrates in a dry mass of a sample of plants.

Carbohydrates	Percentage of content of dry mass
Monosaccharide	8
Disaccharide	18
Cellulose	25
Other polysaccharides	13

- (a) A sample of plant contains 70% water.
 Calculate the mass of cellulose in 500 g of plant.

Mass = g [2]

[Turn over

6

- (b) A large portion of the component 'other polysaccharides' is suspected to be starch.

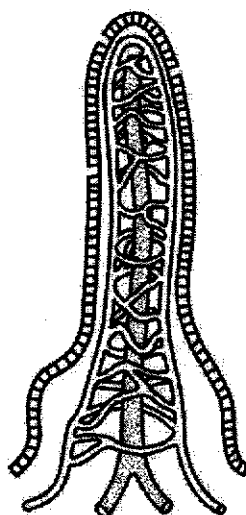
Describe a simple food test which can be used to identify the presence of starch.

.....

[2]

[Total: 4]

- 5 The diagram below shows a structure found in the alimentary canal.



- (a) Name the structure shown in the diagram above and state the part of the alimentary canal where it can be found.

Name of structure:

Part of alimentary canal:[1]

- (b) Suggest how this structure is adapted to its function.

.....

.....

.....

.....

.....

.....

.....[4]

[Total: 5]

- 6 The picture below shows a sample of an advertisement warning against drinking alcohol and driving.



- (a) (i) Explain why it is not advisable to drink alcohol and drive.
-
-[1]
- (ii) Describe **one** other negative effect of excessive alcohol consumption on the person's health.
-
-[1]

[Turn over

8

- (b) Identify the organ where alcohol is detoxified and explain the process of alcohol detoxification.

.....

.....

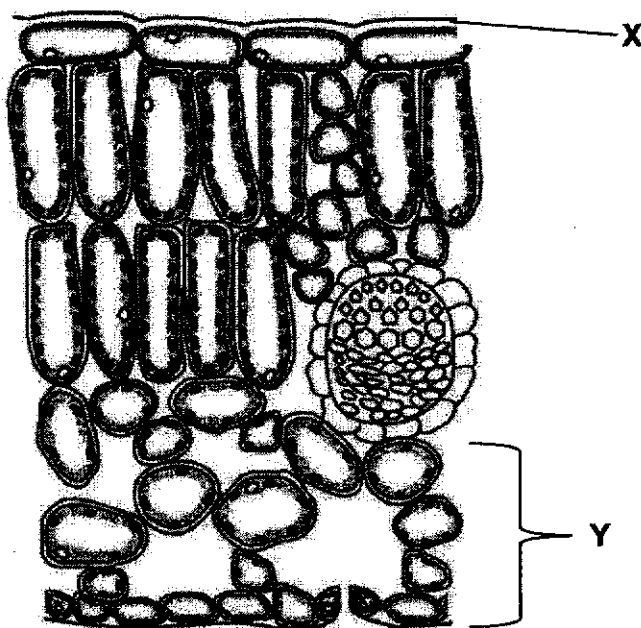
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.....

.....[3]

[Total: 5]

- 7 The figure below shows cells in a part of a leaf of a green plant.



- (a) State the overall equation for photosynthesis.

.....[1]

- (b) Describe how part X is adapted to its function.

.....

.....

.....

.....[2]

- (c) Suggest how the cells in part Y work together to allow carbon dioxide to enter the leaf.

.....

.....

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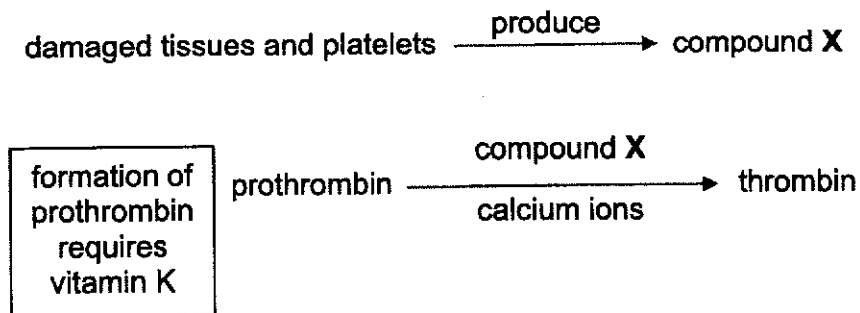
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.....[2]

[Total: 5]

- 8 In the 1980s, rat population in the United States was successfully controlled by a poison known as warafin. Warafin is a compound that works against vitamin K and prevents it from being used appropriately in several animals.

The figure below describes how vitamin K is important in many animals.



- (a) With reference to the above figure, explain why warafin was able to control the rat population in the 1980s.

.....

.....

.....

.....

.....

.....[3]

[Turn over

10

- (b) State the function of fibrin threads in the clotting of blood.

.....
[1]

- (c) Identify compound X.

.....[1]

[Total: 5]

- 9 (a) Describe **two** differences between aerobic and anaerobic respiration.

.....

[2]

- (b) The table below shows the amount of blood (cm^3 per minute) flowing through the whole body and different parts of the body at rest and during exercise of a student during Physical Education class.

Body part	Amount of blood flow (cm^3 per minute)	
	During exercise	During rest
Skeletal muscle	9.3	4.1
Skin	5.7	2.9
Gut	3.3	4.9
Brain	2.4	2.6

- (i) State the part of the body that shows the most significant increase in blood supply during exercise.

.....[1]

- (ii) Describe and explain how an oxygen debt occurs during exercise.

.....
.....
.....
.....[2]

- (iii) After exercising for some time, lactic acid is produced as a result of cellular activities.

Suggest how lactic acid may affect the body during exercise.

.....
.....[1]

[Total: 6]

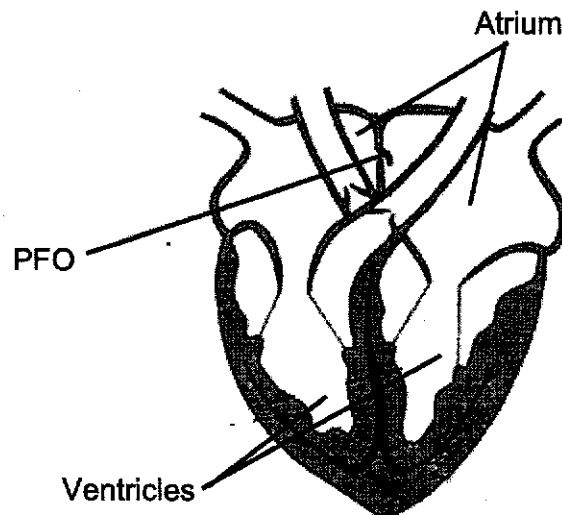
[Turn over

Section B

Answer three questions.

Question 12 is in the form of an **Either/Or** question. Only one part should be answered.

- 10** The figure below shows a vertical section of the heart. It also shows a minor heart defect called patent foramen ovale (PFO). This condition exists in everyone before birth, but most often closes shortly after being born. A PFO results when it fails to close naturally after a baby is born.



- (a) Recent research has shown that there may be a link between feeling faint and light-headed with PFO.

Suggest how PFO may lead to patients feeling faint and light-headed.

.....[3]

- (b)** A doctor listening to the beating of a normal heart through a stethoscope hears two sounds as the blood flows through the heart.

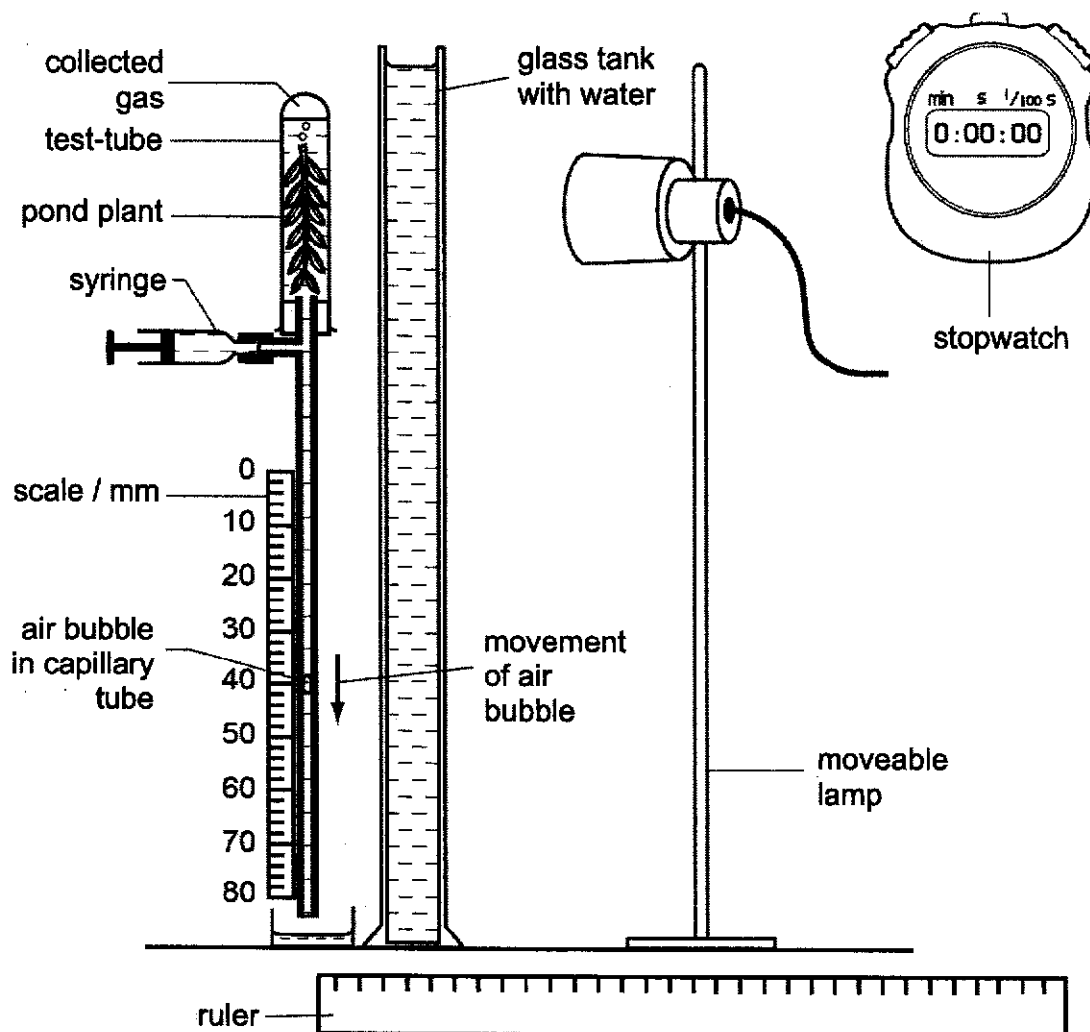
From your knowledge of the cardiac cycle, describe the events that result in these two sounds being produced during ventricular systole and ventricular diastole. PFO does not affect the cardiac cycle.

[7]

[Total: 10]

Turn over

- 11 The diagram below shows a set up by a student who wanted to investigate the effect of light intensity on the rate of photosynthesis of a pond plant.



The student maintained the temperature at 25 °C and measured the distance travelled by the air bubble in the capillary tube for a period of five minutes for each light intensity.

- (a) Suggest **one** reason for including the following apparatus in this experiment:

- (i) Glass tank

.....
[1]

- (ii) Ruler

.....
[1]

15

- (b) Explain why the air bubble moved down the capillary tube over time.

.....

.....

.....

.....[2]

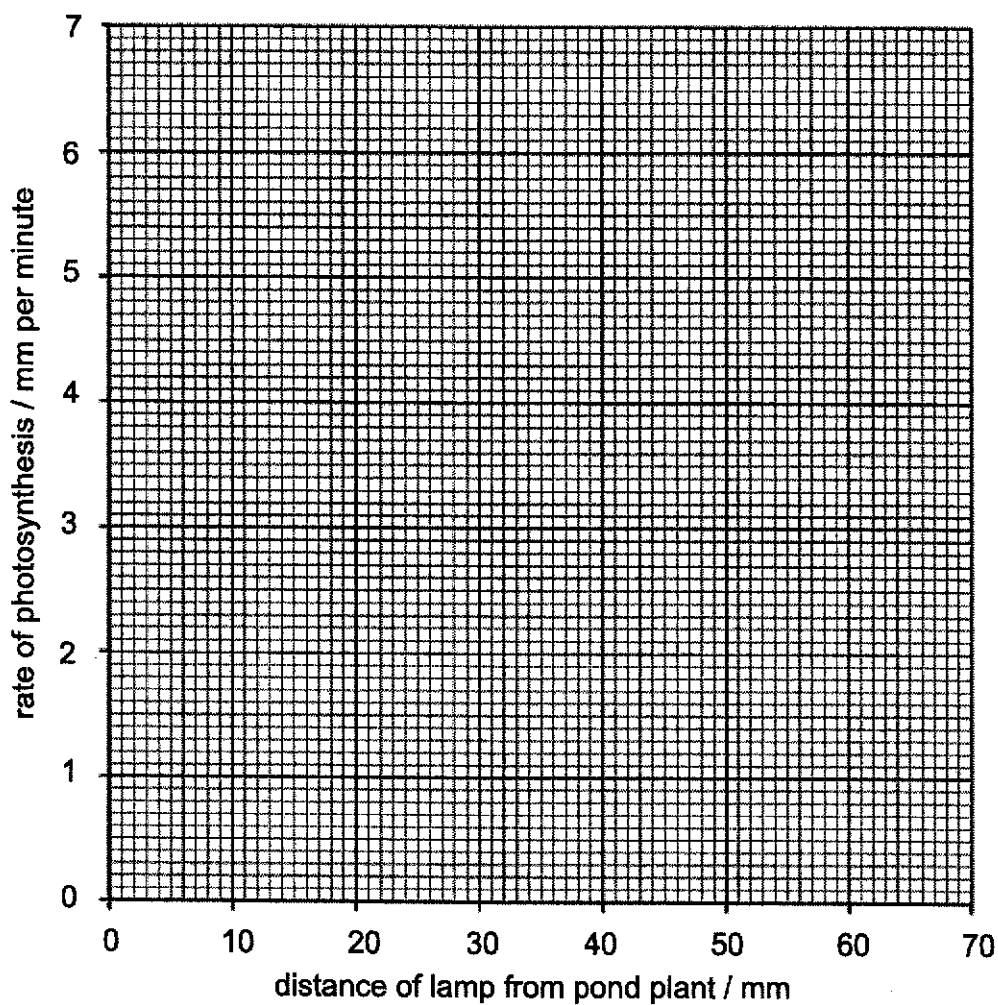
- (c) The students' results are shown in the table below.

distance of lamp from pond plant / mm	distance travelled by air bubble / mm	rate of photosynthesis / mm per minute
10	35	7
20	28	5.6
30	16	3.2
40	8	
50	2	0.4

- (i) Calculate the rate of photosynthesis when the lamp was 40 mm away from the pond plant and write your answer in the table above. [1]
- (ii) Plot the students' results from the table in the grid on the following page and draw a best fit line on the graph to show the relationship between the distance of lamp from pond plant and the rate of photosynthesis. [2]

[Turn over

16



- (d) Explain why the rate of photosynthesis decreased as the distance of the lamp from the pond plant increased.

.....

.....

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.....

.....

.....[3]

[Total: 10]

12 Either

- (a) Describe the similarities and differences in the function of xylem tissue and phloem tissue.

[6]

- (b) Explain how environment factors affect transpiration.**

[4]

[Total: 10]

[Turn over

12 Or

(a) Describe the process of urine formation.

[6]

(b) Explain the process of osmoregulation when a person drinks too much water.

[4]

[Total: 10]



SPRINGFIELD SECONDARY SCHOOL
"BETTER SELF FOR BETTER TOMORROW"
BIOLOGY 6093
Secondary 3 Express
END-OF-YEAR EXAMINATION 2019
MARKING SCHEME

Section A: MCQs (40 marks)

1	C	11	A	21	D	31	A
2	B	12	C	22	D	32	A
3	B	13	B	23	C	33	B
4	D	14	A	24	B	34	B
5	C	15	A	25	D	35	B
6	B	16	C	26	C	36	C
7	D	17	B	27	B	37	D
8	C	18	D	28	A	38	D
9	C	19	C	29	C	39	A
10	A	20	C	30	D	40	A

Section B: Structured questions (50 marks)

Qn No.	Answer	Marks	Total Marks
1(a)	A: chromatin B: mitochondrion C: golgi apparatus D: rough endoplasmic reticulum E: smooth endoplasmic reticulum F: vacuole Note: Do not accept if spelling is wrong. 3m – 6 correct , 2m – 4-5 correct 1m – 2-3 correct, 0m – 0-1 correct	3	10
(b)(i)	- Pancreatic lipase are first made by <u>ribosomes</u>. - <u>Vesicles</u> then pinching off from <u>rough endoplasmic reticulum</u> to transport protein to <u>golgi apparatus</u>. Vesicles fuse with golgi apparatus. - Golgi apparatus <u>modify</u> the protein. - <u>Vesicle</u> containing protein pinching off from the golgi apparatus and move towards the cell membrane. Marks given up to a maximum of three marks for each point.	3	

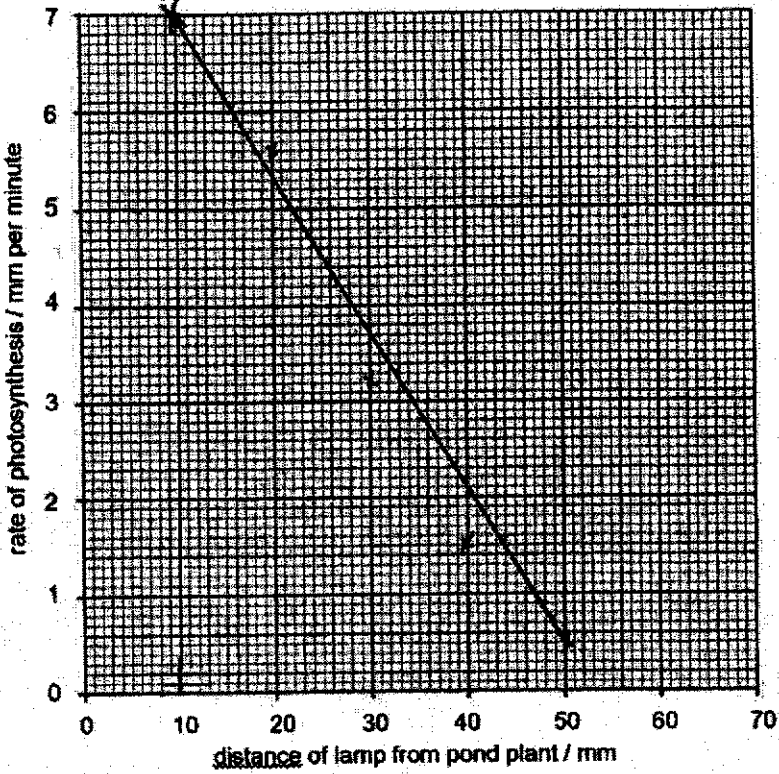
(b)(ii)	Pancreatic lipase has an active site that is complementary in shape with fats. Fats <u>bind to the active site of lipase to form the enzyme substrate complex.</u> [1] Fats will be broken down to <u>form fatty acid and glycerol</u> [1] while lipase remains chemically unchanged at the end of the reaction.	1 1 1	
(b)(iii)	a source and <u>store of energy</u> act as an <u>insulating material</u> to prevent excessive heat loss a <u>solvent</u> for fat soluble vitamins and some hormones form the main part of <u>cell membranes</u> help <u>reduce water loss</u> from skin surface Any two answers will be accepted for 1m. No half mark given for only one correct answer.	1	
2(a)	Osmosis	1	6
(b)	Solution P has a <u>lower water potential</u> than the cells (hypotonic) which caused a net <u>movement of water out of the cells into the solution.</u> This caused the cytoplasm to pull away from the cell wall, causing the cells to be <u>plasmolysed and become flaccid.</u>	1 1 1	
(c)	Solution Q has the <u>same water potential</u> (isotonic) as the cells so there was <u>no net movement of water into and out of the cells.</u> Thus the cells remained the same.	1 1	
3(a)	Enzymes are <u>biological catalysts</u> made of protein. They <u>alter the rate of chemical reactions without themselves being changed at the end of the reaction.</u>	1	4
(b)	High temperature <u>breaks the bonds</u> that keep the enzyme in shape. The enzyme is now <u>denatured</u>; The <u>active site of the enzyme</u> has lost its original 3D <u>configuration</u> and the substrate can no longer fit into the active site.	1 1 1	

4(a)	Percentage of dry mass = $100 - 70 = 30\%$ In 500g of grass sample, the total dry mass = $(30/100) \times 500\text{g} = 150\text{g}$ The percentage of cellulose in 150g of dry mass = $(25/100) \times 150 = 37.5\text{g}$ 1m – working with complete statements 1m - final answer with units	1	4
(b)	Add a <u>few drops of iodine solution</u>. If the <u>sample/solution/mixture turns blue-black</u>/if a blue-black colouration is observed, the "other polysaccharide" is starch.	1	1
5(a)	Name of structure: villus Part of alimentary canal: small intestine Both answers must be correct for 1m.	1	5
(b)	the villus has many <u>microvilli</u> to <u>increase surface area for absorption</u>; the villus has <u>many capillaries / blood capillary network</u> for <u>rapid absorption of nutrients</u> (such as glucose/amino acids/fatty acids/glycerol); the villus has a <u>one cell thick epithelium</u> to <u>increase rate of diffusion and active transport of nutrients</u>; the villus has <u>lacteal/ lymphatic capillary</u> to <u>transport fats</u>. All points must have structure + function to be given the mark.	4	
6(a)(i)	Alcohol is a depressant and <u>slows down brain functions</u>, thus the driver is <u>unable to react quickly to changes</u> on the road OR alcohol may cause <u>blurred vision</u>, thus the <u>driver is unable to see the road</u> and vehicles properly. Any one of the above answers are accepted.	1	5
(a)(ii)	cirrrosis of the liver / gastric ulcers / liver failure Any negative effect of alcohol on health is accepted.	1	
(b)	Liver Liver cells contain an enzyme called <u>alcohol dehydrogenase</u>, which breaks down alcohol to a compound called <u>acetaldehyde</u>. <u>Acetaldehyde can be broken down further to compounds that can be used in respiration</u> to provide energy for cell activities.	1 1 1	

7(a)	$\text{carbon dioxide} + \text{water} \xrightarrow[\text{chlorophyll}]{\text{light energy}} \text{glucose} + \text{oxygen} + \text{water}$	1	5
(b)	Part X has a <u>waxy layer</u> which <u>prevents excessive water loss</u> . It is <u>transparent</u> to <u>allow sunlight to penetrate to the mesophyll</u> .	1 1	
(c)	CO ₂ <u>diffuses into leaf via the stomata</u> as the <u>CO₂ concentration inside the leaf is lower than the atmospheric air</u> . CO ₂ <u>dissolves into the film of water surrounding the mesophyll cells</u> and diffuses into cells.	1 1	
8(a)	Warafin will <u>prevent prothrombin from being formed</u> in rats, as Vitamin K is needed for the formation of prothrombin. There is <u>no thrombin available to catalyse the conversion of soluble fibrinogen in blood to insoluble fibrin threads</u> . The rat <u>cannot clot blood</u> and will most likely bleed to death in the event of any injury.	1 1 1	5
(b)	Fibrin threads <u>trap and entangle blood cells</u> , forming a clot which <u>prevents bacteria and other foreign particles</u> from entering the body.	1	
(c)	Thrombokinase	1	
9(a)	Aerobic respiration requires oxygen, but anaerobic respiration does not require oxygen; Aerobic respiration releases more energy than anaerobic respiration. The products of aerobic respiration are carbon dioxide and water while that of anaerobic respiration is lactic acid. Any two of the above answers are accepted.	2	6
(b)(i)	Skeletal muscle	1	
(b)(ii)	During exercise, muscles contract vigorously to enable movement. <u>Respiratory rate and heart rate increases</u> to enable more oxygen to reach the muscles. When an <u>increase in oxygen intake is insufficient to meet the demands of the body</u> , an oxygen debt occurs. Anaerobic respiration then occur.	1 1	
(b)(iii)	Lactic acid causes <u>fatigue and muscular pains</u> .	1	

Section C: Essay questions (30 marks)

Qn No.	Answer	Marks	Total Marks
10(a)	PFO results in a hole between the left atrium and right atrium, resulting in a <u>mixing of deoxygenated and oxygenated blood</u> . The blood leaving the heart at the aorta <u>thus possesses lower oxygen levels</u> . When blood reaches the brain, there may be <u>insufficient oxygen to replenish the oxygen used by the brain cells</u> . This results in the patient feeling faint and light-headed.	1 1 1	10
10(b)	<u>Both atrium contracts</u> , forcing blood into the relaxed ventricles. After a short pause, the <u>ventricles contract (ventricular systole)</u> . The <u>rise in pressure in the ventricles causes the bicuspid/tricuspid valves to close to prevent the backflow of blood</u> . This produces the 'lub' sound. The <u>semi-lunar valves open</u> and blood flows from the ventricles into the pulmonary arch / aortic arch. As the <u>ventricles contract, the atrium relaxes</u> . The right atrium receives blood from the vena cava while the left atrium receives blood from the pulmonary veins. The <u>ventricles then relax (ventricular diastole)</u> . The <u>fall in pressure causes the semi-lunar valves to close to prevent the backflow of blood from the pulmonary arch / atrial arch</u> . This produces the 'dub' sound.	1 1 1 1 1 1 1	
11(a)(i)	Glass tank: reduces the heat effect of the lamp / act as a heat filter / maintain constant temperature / ensure that temperature is not changed by the distance of the lamp.	1	10
(a)(ii)	Ruler: to <u>accurately measure the distance of the lamp from the pond plant</u> .	1	
(b)	Pond plant carries out <u>photosynthesis</u> , releasing oxygen gas from <u>the stomata</u> of the leaves. The <u>oxygen gas pushes water down the tube</u> , thus moving the air bubble down the capillary tube.	1 1	
(c)(i)	1.6 mm per minute (8 mm divided by 5 minutes)	1	

(c)(ii)	 rate of photosynthesis / mm per minute distance of lamp from pond plant / mm 1m for correct plotting of points 1m for smooth line of best fit drawn	2	
(d)	<u>Increased distance of the lamp</u> from the pond plant would result in decreased light intensity. <u>Decreased light intensity</u> would result in lesser light energy being absorbed by the chlorophyll in chloroplast. Light intensity is thus a <u>limiting factor</u> in photosynthesis.	1 1 1	

Either 12(a)	Similarities: • Xylem and phloem are <u>vascular tissues</u> and <u>transport substances around the plant</u>. • Xylem and phloem are both formed from the <u>division of the cambium</u>. Differences: • Xylem tissue <u>transports water and mineral salts from the roots to the leaves</u>, while phloem tissue <u>transports sugar and other products from the leaves to all other parts of the plant</u>. • Xylem tissue allows only <u>one direction of movement</u>, while phloem tissue allows for <u>bi-directional movement</u> to upper and lower parts of the plant. • Xylem tissue is made up of <u>dead tissues</u> while <u>phloem tissues are made up of sieve tube elements with companion cells to keep the sieve tube elements alive</u>. • Xylem vessels <u>are hollow with the absence of cross walls</u>, while phloem tissue have <u>cross walls that contain cytoplasm within the sieve tube elements</u>. • The <u>main suction force pulling water and mineral salts up the plant in the xylem tissue is transpiration pull</u>, while <u>transport of substances in the phloem tissue is due to translocation</u>. Any six answers are accepted. Marks only given if both xylem and phloem are compared with regards to their structure and function.	6	10
12(b)	• Humidity: As humidity increases, the difference in water vapour concentration (between the outside and inside of leaf) decreases, resulting in a decrease of transpiration rate. • Temperature: As temperature increases, the rate of evaporation of water increases, leading to an increase in the rate of diffusion of water vapour, increasing transpiration rate. • Wind: An increase in wind will cause more water vapour outside the leaf to be blown away, increasing rate of diffusion of water vapour, increasing transpiration rate. • Light intensity: Size of stomata increases as light intensity increases, increasing rate of diffusion of water vapour, increasing transpiration rate. Note: Answers that relate to a decrease in environment factors are correct as well if the responses to the environment factors are accurate.	4	

Or 12(a)	• <u>Blood enters the kidney via the renal artery, which then branches into several arterioles and eventually reaching the glomerulus.</u> • <u>Ultrafiltration occurs, where water and small molecules such as glucose, amino acids are filtered while large molecules such as blood plasma remains in the blood.</u> • <u>Selective reabsorption occurs at the proximal convoluted tubule, where glucose, amino acids and mineral salts are reabsorbed via diffusion and active transport.</u> • <u>At the loop of Henle, some water is reabsorbed from the filtrate via osmosis.</u> • <u>At the distal convoluted tubule, more mineral salts are reabsorbed into the blood via diffusion and active transport.</u> • <u>At the collecting duct, more water is reabsorbed back into the bloodstream via osmosis into the capillaries.</u> • <u>The remaining fluid passes out of the collecting duct into the ureter and into the renal pelvis to form urine.</u> Accept answers up to a maximum of 6 marks.	6	10
(b)	• Due to a large intake of water, the water potential of blood plasma increases. • This stimulates the hypothalamus of the brain, which causes the pituitary gland to produce and secrete less Anti Diuretic Hormone (ADH). • This results in the collecting ducts located at the nephrons being less permeable, thus less water is reabsorbed. • The water potential of the blood plasma thus decreases back to normal levels.	4	